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Fourth
Progress Report
on

FIRE DETECTION IN AIRCRAFT ENGINE NACELLES

by

C. S. McCamy and Wm. F. Roeser

Covering period 25 January, 1953 to 25 April, 1953

for
Headquarters
Wright Air Development Center
Wright-Patterson Air Force Base
Dayton, Ohio
Project No. 52-660A45

WCLEN-3

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1. Summary

Measurements of the spectral distribution of radiation, the frequency of the flicker, and the amplitude of the flicker from various types of flames are being made in five spectral bands covering the range 0.23 to 3 µ.

Arrangements are being made to study the limitations of Geiger-Muller tubes and of thermistor bolometers in fire detecting systems. The feasibility of utilizing fusible electrolytes in fire detecting systems is also being studied.

2. Radiation from Flames

Measurements are being made of the radiation characteristics of flames in five different spectral bands covering the range 0.23 to 3 u with a calibrated spectroradiometer in conjunction with a low frequency wave analyzer and a continuously recording oscillograph. These measurements yield: 1) the spectral distribution of the radiation; 2) the frequency of the flicker; and 3) the amplitude of the flicker. Although measurements made thus far have been limited to flames with various fuel-air ratios and diffusion flames in still air, it is planned to make similar measurements on flames in air moving at various speeds.

3. Geiger-Muller Tube

An ultra-violet sensitive Geiger-Muller tube and the necessar accessory circuits have been assembled for experiments to determin the applicability of such tubes to fire detection.

4. Thermistor Bolometer

One of the major problems encountered in the design of radiation type fire detectors is the inability of existing photoelectri detectors to retain their sensitivity at the high ambient temperatures encountered in engine spaces. A cursory investigation of a

radiation receiver known as a "thermistor bolometer" indicates that it may retain its sensitivity at high temperatures. Arrangements have been made to obtain and test such a bolometer.

5. Fusible Electrolytes

There are certain chemical compounds which, in the solid state, produce no perceptible electrolytic effect but which, in the liquid state, become active electrolytes. The use of such a material in conjunction with two dissimilar metals to form a battery when the temperature is raised above the melting point has been used in a number of applications and has recently been proposed for use in fire detecting systems. This principle may be adapted to either a "spot" or "continuous" type system.

Demonstrations with relatively simple equipment indicate that it is possible to obtain the required time of response with such a system. No study has been made of the materials required to withstand the reaction that may take place at the very high temperatures attainable in flames. One possible objection to a system of this type is that, once installed in an engine nacelle, the temperature at which it operates cannot be altered because the melting point of the electrolyte is an inherent property of the material.

6. Financial Condition

Expenditures and commitments on this project:

April 25 through December 31, 1952	$10,733.37
January 1 through March 31, 1953	4,827.27
Total through March 31, 1953	$15,560.64